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ABSTRACT

Variations in public services and tax rates among communities may cause property values to vary, a concept referred to by economists as capitalization. The purpose of this booklet is to describe and evaluate the implications of capitalization primarily for school finance changes and secondarily for property tax changes. Section 1 describes the conditions necessary for capitalization and the process of capitalization itself. Section 2 presents several theories discussed in the literature and several studies that have measured the magnitude of capitalization. Section 3 analyzes both the short- and long-term capitalization effects of specific changes in state aid with attention to aid for public schools. The appendix offers an annotated bibliography. (Author/LD)

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Expenditures and Tax Capitalization: Its Relation to School Finance and Tax Reform

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Executive Summary

Variations in public services and tax rates among communities may cause property values to vary. This process is termed capitalization and although economists have analyzed it for a number of years, only recently have capitalization effects been considered in school finance and property tax reform discussions. The purpose of this booklet is to describe and evaluate the implications of capitalization primarily for school finance changes and secondarily for property tax changes.

After synthesizing the literature on capitalization and describing the approaches to its measurement, the booklet describes the process of capitalization for several alternative methods of financing schools and for several uses of increased state aids. The general implication of this analysis is that if increased spending for schools is capitalized into property values, the actual direct cost of the program to the state will decrease in subsequent years because tax revenues also will increase. Moreover, if a reduction in property taxes is capitalized, tax receipts will not fall by the full amount of the tax reduction.

Capitalization effects raise other issues for traditional school finance analysis and equity. The correlation between high property values, high public expenditures and low tax rates has been taken as evidence of the inequitable advantage of some school districts. But full capitalization of these variations implies that property values are high because public expenditures are high and tax rates are low, rather than causality originating in property values. Therefore, some so-called "advantaged" districts are not really advantaged, and in fact, the typical family in that district may be paying the same amount in terms of housing costs and taxes for a given level of school expenditures as they would in a "disadvantaged" district.

An equity consideration that arises concerns the windfall gains and losses that may result from a change to the distribution of aids or tax liabilities. What about the family that has paid an inflated price for housing in a community in order to use their high quality schools, but does not receive the benefits because a change in the method of financing schools alters the relative advantage of this district? This problem is evaluated from both efficiency and equity perspectives.

Throughout the booklet, the dollar values of capitalization effects found by other researchers are reported. In several instances these estimates are used to simulate the change in property values that may result from specific school finance reforms. These findings are only illustrative. They may not be representative of the effects in other communities, under different circumstances or at a different point in time.

Introduction

Variations in tax rates and public services across communities may cause property values to vary. Capitalization is the term economists use to describe this process. Its technical definition is the change in present value of a durable asset that results from the future accumulation of changed costs or benefits associated with that asset. The process of capitalization holds special importance because it generally is assumed that property values measure the community's ability to pay and dictate tax rates and the quantity of public services, particularly public education for elementary and secondary students. However, these two factors also may affect property values. To put it simply, both better schools and lower tax liabilities generally lead to higher property values. Thus, capitalization effects of changes in state aid or other public programs may produce second-round changes that affect the original policy.

The reader will notice the tentative nature of the statements concerning the impact of better public services or lower taxes on property values. Almost everyone wants better schools, better police services, cleaner streets, more parks and lower taxes, but the intensity of these wants may differ, as will the additional price they are willing to pay. If potential residents are not willing to pay for the improvements, or to forego certain public services in order to obtain a lower tax rate, the capitalization effect will be very small or absent.

This booklet offers policy makers a discussion of the conditions necessary for capitalization to occur and some of the implications of capitalization. Theoretically, it may take place in any situation where there are variations in tax rates or in the types and quantities of public services (termed interjurisdictional fiscal disparities). The concern of this booklet is whether capitalization can occur in the context of school finance reform and what are the implications of capitalization for reform.

Section I describes the conditions necessary for capitalization and the process of capitalization itself. Section II presents several theories discussed in the literature. One posits that capitalization is due to an imperfect match between the goods and taxes offered by communities and the goods and taxes desired by individuals. Another asserts that it occurs when differences between tax liability and public services received arise within a community.

Section II also discusses several studies that have measured the magnitude of capitalization; some have demonstrated capitalization of benefits and taxes, others have not. Section III analyzes both the short- and long-term capitalization effects of specific changes in state aid with attention to aid for public schools. It also raises some of the questions about capitalization that policy makers need to consider. For instance: How does one address the problem of reduced property values for homeowners living in districts that have not benefited from the changed state aid or other public program? If all relative advantages and disadvantages are capitalized, can different taxpayers be paying different prices for the same amount of public services? The final section summarizes the findings and raises some additional considerations for this topic.

I. The Process of Capitalization

State and local governments are becoming interested in capitalization because an increase in property values represents an additional product of an expenditure program and offsets some of the direct cost of government outlays for that program in subsequent years. Thus, for example, a new program of state aid may be less expensive if the increased property values and subsequent increased tax revenues are included in the calculation. By the same token, decreases in property values due to a redistribution of government outlays could reduce future revenues in addition to raising difficult political questions.

All state and local government aids or programs are not necessarily going to be capitalized. As the discussion in Section II will demonstrate, the monies must provide something the residents (or hopeful residents) want and it must not be available in a large number of places. This is significant especially for school finance reform. To accomplish reform as envisioned by the courts probably will require additional state aids. Public education is one of the public services that people generally value, and as a result, increased spending usually is capitalized into property values. Because the increased property values should generate additional tax receipts, the long-term cost of the aid program should be less than originally estimated, as long as the capitalized gains are greater than the capitalized losses.

Moreover, property tax changes should not alter tax receipts by the exact product of the changed tax rate times the tax base. Lower taxes usually attract households with the result that people are willing to pay a higher price for a house in a community with a low tax rate relative to a similar house in a community with a high tax rate. Capitalization of the tax rate variation makes it likely that tax receipts will not fall by the full amount of the tax reduction and conversely, tax receipts will not rise by the full amount of the tax increase times the tax base.

Although the focus of this booklet is capitalization of variations in school expenditures and tax rates into the value of property, capitalization is more general. Certain conditions are prerequisite. First, the change in taxes or benefits must not affect all assets equally. Second, the change must extend into the future. Third, the

asset must be durable. Fourth, the taxes or benefits cannot be shifted by the owner of the property to someone else.

The first condition means that the advantage or disadvantage of an asset relative to others must be altered. Thus, a tax increase in Community A while Community B makes no change will alter the attractiveness of property in A relative to B, and this will be reflected in property values of both A and B. The second condition is that the change in taxes or benefits is expected to persist for a number of years. For example, a one-time tax credit without the expectation that it will occur continuously into the future will not be capitalized. If the asset does not change ownership, the additional taxes or benefits will be absorbed by the current owner and will not be reflected in the asset's value. Further, the longer the additional tax or benefit is expected to last, the greater the change in the value of the asset. The third condition is that the asset must exist in the future in order for any future costs or benefits associated with it to be capitalized. The fourth requirement is necessary so that a change in value will be borne by the owner. If the tax or benefit can be shifted by the owner, then the tax or benefit is not a characteristic of the asset, and its value will not be affected. The mathematical formula for capitalization is presented in Appendix A.

Although variations in tax rates have an explicit dollar value and popular attitudes toward them are quite uniform, a dollar equivalent of benefits is not so straightforward. For this reason, the relation between increased expenditures and increased benefits may not be obvious. In many instances, groups of taxpayers probably will vary in their assessment of the value of the benefits their tax dollars are making possible. Persons without children, for example, may not place as high a value on increased spending for elementary education in their communities as families with children do.

To illustrate the process and effect of capitalization, consider two communities, A and B, that are identical except for tax rates and the level of education provided. Further, suppose that all residents of both communities value education for their children very highly.

To begin with, suppose that communities A and B have equal tax rates. The school district in Community A, however, is able to increase expenditures for education because it has received additional state aid. Expenditures for education increase to \$1,500 per pupil in A, while in B the figure remains at \$1,000 per pupil. Further, suppose the state aid to A is expected to last indefinitely and future returns are discounted at 10 percent a year. Discounting refers to the rate at which a person is willing to exchange something in the future for the same thing now. A discount rate of 10 percent means

that \$1 next year is worth only \$.90 today. Thus, because people are willing to pay more for a house so that they have access to the extra education services, property previously valued at \$40,000 will be sold for \$45,000 in A.*

In a second example, both communities provide the same education services, but the property tax rate in Community B must be raised to be double that of A. For purposes of exposition the difference in tax liability can be considered to be due to inefficiency in the provision of public services in B. Suppose that, as a result of the inefficiency, the owner of a \$40,000 property in A pays \$1,000 per year in taxes while the owner of a similar property in B pays \$2,000 per year. If this difference is to last indefinitely and if the discount rate is 10 percent, property in B that previously was valued at \$40,000 will now be valued at \$30,000, assuming full capitalization. Thus, the discounted present value of the tax increase reduces the price of the asset by \$10,000. An owner selling property in B must compensate buyers by this amount to induce them to purchase his property rather than a similar one in A.

Therefore, capitalization of benefit and/or tax variations changes the value of property. The magnitude of the change in value depends on the size of the benefit or tax variation, as demonstrated, and it also depends on the discount rate used in the calculation and the length of time that the variation is expected to persist.

* It is very difficult to provide a simple example because so many things are changing. The increase in value of \$5,000 is based on the assumption that the change is fully capitalized. This may not be the case, however, because capitalization changes the relative prices of education services and housing services which may change the quantity consumed of both, and may produce other ripple effects. Further, if it is a totally closed system — no new entrants — property values in B are likely to fall.

II. Theories of Capitalization

When are variations in public expenditures and tax rates capitalized and when are they not? Theories developed by economists have articulated several circumstances which lead to capitalization. These theories are examined and results of several tests for capitalization of expenditure and tax variations are presented in this section. The studies referred to in this section, plus several others, are discussed in greater technical detail in Appendix B.

The Tiebout Approach (Voting With Their Feet)

Tiebout (1956) was the first to show how variations in publicly provided goods and taxes could be capitalized. He considered a system in which communities offer different combinations of public goods and taxes. Each family prefers one combination and selects the community coming closest to providing it. Variations of public goods and taxes are represented by differing levels of the same types of services, differing types of goods, and differing levels and types of taxes. If there are more families having a certain preference than there are places in communities matching it, competing families attempt to bid a place away from a family already having one. As a result, the price of property increases in these communities. Families view the variation of public goods or taxes as an advantage or disadvantage of owning a house in that community. They calculate, perhaps unconsciously, the present value to them of the future benefits or costs and alter the price they are willing to pay.

There are several essential features of the system. Families or individuals must value the public goods provided, and communities offering those combinations of public goods and taxes must be in short supply. For instance, if many communities provide good police and fire protection, and spend large amounts on public education relative to people's preference, these benefits will not be capitalized, i.e., households preferring this set of public services will not have to pay a premium to locate in such a community. As Hamilton (1976b) contends, it is possible that communities with high taxes and low levels of public services are in short supply given what people want. Therefore, not all variations in public expenditures are capitalized and no

capitalization need occur if consumer preferences and community offerings match perfectly.

Empirical tests of Tiebout's hypothesis generally have measured whether property values increase as expenditures for public schools rise and whether property values drop in places with relatively higher tax rates. A simple correlation between property values and taxes or expenditures is not verification because other factors also affect property values, taxes and expenditures or all three simultaneously. Therefore more comprehensive statistical analysis is used to isolate the effect of tax rate and benefit variations on property values from other influences.

Oates (1969) tested for variations in public school expenditure and tax rate capitalization across 53 communities in New Jersey. His test concluded that both factors were capitalized into average property values. In these New Jersey communities, where the average value of a house in 1960 was approximately \$20,000, increasing school expenditures from \$350 to \$450 per pupil annually raised property values by approximately \$1,200. Raising property tax rates from two to three percent, an additional \$200 tax liability annually, reduced the value of property by \$1,500. Whether a simultaneous increase in school expenditures and property taxes, which may be the case, raises or lowers property values in a community cannot be concluded unless the proportion of nonresidential property and the number of children per household is known. In this example, if the \$100 per pupil increase is financed with state aid without any local tax increase, then the average property would increase in value by approximately \$1,200 assuming full capitalization. Another feature of Oates' estimates was that the change in property value was not constant at all levels of expenditure or tax liability. For example, increasing school expenditures per pupil from \$450 to \$550 raised property values by approximately \$1,000, whereas they increased by \$1,200 for a \$100 dollar increase from \$350 to \$450. The implication is that families may be less willing to pay for additional school expenditures when the level is already relatively high.*

Pollakowski (1973) attempted to replicate Oates' results using communities in the San Francisco region, but he could not conclude that differences in public school expenditures among these communities were capitalized. He did find, however, that tax rates were capitalized.

*Although this feature of Oates' estimates is very interesting, it is not a definitive finding. Other researchers have found that the magnitude of the capitalized benefit is not dependent on the original level of expenditures.

Initially, the results of Oates and Pollakowski appear to be contradictory but Hamilton contends that the problem needs to be redefined. Whether people distribute themselves among communities as hypothesized by Tiebout is not verified or disproved by capitalization of predetermined fiscal variables such as expenditures per pupil. The real question is: Are consumers sensitive to public goods and services that are in short supply relative to demand in the short term? These two research outcomes simply demonstrate that communities spending large amounts of money on public education were in short supply in New Jersey in 1960, but were not in short supply in the San Francisco area.

Hamilton's point is crucial to the concept of capitalization. It does not imply uniform preferences for high levels of public spending for schools or some other public good. What is required for variations in spending and taxes to be capitalized is that some families are sensitive to the variations and act accordingly.

Other studies of capitalization using the Tiebout framework include Edel and Sclar (1974), Meadows (1976) and Inman (1977). Edel and Sclar determined that variations in school expenditures per pupil were capitalized in Boston area communities in 1950, but not in 1960 and 1970. They interpret these results to show that consumer preferences and community offerings in 1960 and 1970 were matched among different communities in the Boston area.

Meadows, using the same sample of New Jersey communities that Oates used, estimated that increasing school expenditures by \$1 per pupil raised property values by \$35 for properties valued at \$20,000. Moreover, raising the tax rate by one percent (\$200) lowered property values by approximately \$4,200 and increased municipal spending on other goods and services by \$1 per capita increased property values by approximately \$92. These results differ somewhat from those of Oates because Meadows corrected for other factors that affect property values and he also assumed that the extent of capitalization was independent of the original level of spending and taxation.

Another feature of Meadows' study was that he considered the interrelationship between spending for education, other goods and services and taxes. For example, the full effect of a change in taxes on property values is composed of several partial effects. A change in taxes — which changes revenues — should affect school expenditures and expenditures on other municipal goods and services. However, as discussed, changes in these expenditures should affect property values. The entire system is interrelated; to look at only one stage of the process skews the findings. This approach has an

important implication for cost estimates of changes in public programs. Specifically, initial estimates of cost are likely to overestimate the actual long-term cost of some state and local programs and of tax reduction.

Inman demonstrated that school expenditures, other public expenditures and tax rate variations are capitalized in the New York metropolitan region. He emphasized the practical importance of capitalization and said that if the second-round adjustments are overlooked and not incorporated into the analysis of local fiscal behavior, the long-term impact of reformed school aid packages or other state aids will be predicted incorrectly.

One difficulty alluded to earlier is assessing variations of public services. For example, say Community A is more efficient at producing educational services than Community B. If both communities spend \$1,000 per pupil per year, students in Community A receive a better education than students in Community B. A family having a strong preference for quality education would view the two communities as equally desirable if the amount of money spent is used as the criterion. Thus, the variation of benefits would not be capitalized into property values.

Rosen and Fullerton (1977) investigated whether the capitalization of variations in expenditures and taxes depended on how benefit variations had been measured. The benefits most families want are outcomes like good police protection, maintained roads and quality education. These outcomes are hard to quantify, so in most studies the amount of money spent on such activities is used. Rosen and Fullerton suggested three reasons why the amount of money spent may not be a good measure for quality of schooling: (1) the prices of education inputs may vary across communities, (2) some communities may be more efficient at producing education services and (3) the nonschool learning environment may differ among communities. They tested whether the measure used made any difference and determined that it did. Based upon 1970 data for a sample of New Jersey communities similar to Oates', variations of achievement test scores were capitalized but variations of expenditures per pupil were not. They determined that having the achievement test scores of the community's public schools in the top decile relative to the bottom decile was associated with a \$4,300 increase in the median property value, when all other factors were constant. Rosen and Fullerton never asserted that achievement scores reflect actual school quality, but rather that achievement scores "represent perceived quality of education better than do expenditure data."

The capitalized values presented above are illustrative. They reflect conditions in a set of communities at one time. A \$100 variation per

pupil in spending for public schools today will not necessarily increase property values by \$1,200 in New Jersey communities or elsewhere. It may be more, it may be less. According to the Tiebout approach, the exact value depends on the preference families have for education and the number of communities satisfying it.

An approach that is conceptually identical to Tiebout's, but has different implications for the measurement of capitalization is the characteristics approach. This approach posits that a good exchanged in a market is composed of characteristics and it is these that are the real concern of the consumer. Each good contains different characteristics and different quantities of them; the explicit price of the good reflects the particular quantities of the characteristics associated with it (Rosen, 1974). For instance, a house is the object exchanged in a real market, but consumers are interested specifically in the number of rooms, the size of the lot, whether it has a fireplace, a view, the quality of schools and the tax liability. If an implicit price is attached either to schools or to taxes — if either is a factor in the decision to purchase — then capitalization has occurred.

There is a distinction between variations in taxes and public expenditures which are capitalized and property values which vary according to taxes and expenditures. Presumably, if property in one community is disadvantaged relative to property in other communities due to a greater tax burden, the discounted present value of the future tax burden will be capitalized into the property value. Moreover, if property in the same community is advantaged relative to property in other communities due to a greater level of benefits, the benefits will be capitalized into property values. If benefits and taxes are exactly offsetting, the value of the property will not have changed relative to its original position and relative to property in other communities, but capitalization will have occurred. This situation differs from the case when benefit and cost capitalization are not exactly offsetting. Under this condition, the value of property changes. In both situations, benefits and costs are capitalized, but only in the latter has the value of property changed.

The characteristics approach is similar to the Tiebout approach, but it permits a more detailed look at capitalization. The Tiebout theory requires that the quality of education be treated as the same throughout a community. Schools within a community differ, however, and the characteristics approach can accommodate these differences.

Most studies using the characteristics approach have estimated tax capitalization because of the difficulty associated with measuring

benefit variations in the same community. Wales and Wiens (1974) did not observe capitalization of tax liability variations due to differences in the ratio of assessed value to market value in one Canadian municipality. Church (1974) found capitalization of tax liability variations in Marvinez, California. Smith (1970) noted capitalization of changed assessment ratios in San Francisco that resulted in increased tax liability for homeowners. Moody (1974) determined that the increased tax liability for communities included in the Bay Area Regional Transportation (BART) taxing district in the San Francisco region was capitalized into property values. A one mill increase in the tax rate decreased property values by \$285 to \$478 relative to communities that had access to BART but no extra tax liability.

Vincent and Reinhard (1979) used the characteristics approach to analyze school expenditure and tax capitalization. They estimated the impact of capitalization for the San Mateo region for 1969-70 and for the San Jose region for 1977-78. In both instances they used measures for education achievement and expenditure levels. In San Mateo County, assuming complete capitalization, a one unit improvement in reading and math scores was associated with a \$1,340 increase of property value for houses of average value, and a \$1 increase in school expenditure per pupil (ADA) was associated with a rise in property values of \$25. Each additional dollar of property tax payment was associated with a \$20 decrease of housing value for the average house. For the San Jose region, a one percent increase in achievement test scores was associated with a \$560 increase in property values, assuming 90 percent capitalization and an average property value of \$85,000. A one percent increase of school revenues per pupil, approximately \$16, was associated with about a \$220 increase in property value. Thus, an additional dollar spent per pupil at the average school resulted in a \$14 increase in the value of the average house.

Capitalization of Fiscal Surpluses

Hamilton (1976a) formulated the fiscal surplus approach. Benefits and taxes are not capitalized per se, but the difference between the two (fiscal surplus or fiscal deficit) affects property values. A fiscal surplus increases property values and a fiscal deficit decreases them when all other factors remain constant. This is the essence of the approach: Capitalization occurs if the dollar value of benefits and tax liability are not equal.

Differences between benefits and taxes occur because a community is not homogeneous. For example, suppose every house in a

community is valued at \$50,000, every family has one child in a public school and all families decide to spend \$2,000 per pupil for public education. To pay for the education, a tax rate of four percent is set, which results in each homeowner paying \$2,000 in taxes. Because tax liability equals benefits, no capitalization occurs.

But suppose some property in the community is valued at \$40,000. If the families decide to spend \$2,000 per child, the new tax rate will be greater than four percent because the tax base, the average value of housing, has decreased. The tax liability of the \$50,000 properties becomes more than \$2,000 and the liability of the \$40,000 properties is less than \$2,000. The wealthier properties experience a fiscal deficit; the value declines relative to what it would be in a community composed only of \$50,000 properties. Likewise, the value of the \$40,000 property increases relative to its value in a community composed only of \$40,000 properties.

Three implications follow from Hamilton's approach. The first is that in a school finance program requiring equal expenditures per pupil, there would be no variation of education spending among school districts. Capitalization occurs, however, because the tax liability of some school districts will be greater than benefits received while the situation would be reversed for other districts.

The second implication is that current residents of communities will seek zoning restrictions to prevent the building of housing worth less than the average value. Current residents do this because the value of their property would decline when such housing causes a fiscal deficit. This situation would hold any time that all families in a community receive equal amounts of public services.

The third probably is the most important: full capitalization leads to horizontal equity, which means that the price paid for a benefit is equal everywhere. In the example above, if three-fourths of the housing is valued at \$50,000 and one-fourth at \$40,000, the average price of housing will be \$47,500. The tax rate necessary to raise \$2,000 revenues per student is 4.211. As a result, the tax liability of the more expensive houses is \$2,105 each and \$1,684 for the less expensive houses. Assuming a discount rate of 10 percent and full capitalization, the more expensive houses would be reduced in value to \$48,950 and the less expensive houses would be increased in value to \$43,160. In the past, residents paid \$50,000 plus \$2,000 a year to obtain \$2,000 worth of benefits. After capitalization has taken place, they are paying \$48,950 plus \$2,105 per year for \$2,000 in benefits. The discounted present value of the additional tax payment exactly offsets the reduced property value, therefore, the two prices (\$50,000 and \$2,000, and \$48,950 and \$2,105) are exactly equal.

Summary

The evidence is quite conclusive. Both improved school quality and decreased tax liability generally are capitalized into property values. However, capitalization of these factors would not take place if all schools improved their quality to the same level and if all taxes were reduced to the same rate. Capitalization occurs only if an asset's status relative to other assets is altered.

For a state to evaluate the long-term effects of school finance reform on property values, the Tiebout approach would be the most practical. For a study to cover the entire state, the only feasible approach would be to consider each community as a whole and to suppose that public services and taxes are uniform throughout that community. The most precise and complete formulation of the Tiebout approach would be the model and method used by Meadows because more of the interrelationships are taken into account. Variations in average property values could be correlated with variations in school quality measures, taxes and other public services among communities. If expenditures per pupil were used, it could be adjusted with a cost-of-education index. Further, with this type of model, known technically as a simultaneous equations model, partial and full effects of tax and quality changes could be evaluated.

Conversely, for a more geographically limited entity to assess the second-round effects (increased property values) generated by a new school or some other public improvement, the characteristics approach would be most appropriate. Individual property values could be correlated with characteristics of the public service, in addition to the usual determinants of value such as number of rooms, lot size, etc. If, for example, school characteristics such as quality of the facility are capitalized, construction of a new school may increase property values which may offset the tax increase necessary to finance it.

III. Implications of Capitalization

Capitalization of expenditure and tax changes has important implications for school finance. Expenditures for education add to the value of homes and other real property. In the long run, property tax reductions may induce movement of resources to allow revenue requirements to be met at a lower rate of taxation, or reduced rates of taxation may be able to support additional public goods. However, capitalization also has important implications for the interpretation of property wealth and tax rate differences, and for those districts not aided by reform. This section analyzes specific school finance formulae to assess how they might be capitalized into the value of homes and other real property. Further, it addresses the issue of windfall losses and gains due to reform, horizontal equity and tax and expenditure limits.

Capitalization of State Aids

The method of distributing state aid for education to local school districts is an important issue from policy and political perspectives. The achievement of state policy goals towards school finance can be dependent on the exact structure of the formula. Political support for the policy may depend on whether a district wins or loses, a fact which can be manipulated by the formula. The issue addressed here is the process of capitalization in several different formulae. Specifically, variations of power equalizing, foundation aid, recapture and unrestricted flat grants are incorporated in capitalization calculations.

Consider two hypothetical communities. In Community A each property is valued at \$40,000 and each property is assessed at \$60,000 in Community B. Suppose that prior to the changes described below, the communities received no state aid for education. To show response to changes in state aid, assume that the state consists wholly of homogeneous communities, each varying slightly in the value of property per household. Thus, aid distributions should affect communities differently — generate various fiscal surpluses or deficits — and therefore, it is assured that families will move in response to fiscal surpluses or deficits. Further, for purposes of calculation for all of the following examples, it is assumed that the

change in state aid is expected to last 40 years and that families use a discount rate of five percent.

Initially, consider the case in which the state uses a power equalizing formula to distribute aid to public school districts. The state guarantees a minimum of \$500 for each one percent tax rate. Both communities are profiled in Table 1. If both communities tax property value at three percent, Community A raises \$1,200 per pupil without power equalizing and receives \$300 per pupil in state aid. Community B raises \$1,800 per pupil and receives no state aid because its tax yield is above the power equalizing schedule. Capitalization occurs in Community A because it has a fiscal surplus and people are encouraged to move there, but no capitalization occurs in Community B.* The full capitalized value of the \$300 per pupil in state aid is approximately \$3,400 and property wealth per pupil increases to approximately \$43,400. The post-capitalization tax liability of households in Community A increases to \$1,302, an increase of \$102. Thus, in succeeding periods, state aid per pupil to Community A decreases from \$100 to \$66 per one percent tax rate.**

*A number of caveats must be stated. The full capitalization value assumes that no substitution takes place between purchasing education services and housing services. As the price of housing increases, people may decide to consume less of it. Further, if the system is closed — no new families moving in — part of the capitalization will be observed in a reduction in housing prices in B. That is, there will be a decreased demand for property in Community B, which will reduce the price. The exact split between increased property values in A and decreased values in B depends on the preferences of the consumers.

**This supposes that each household has only one child in public school and that there is no commercial property to help offset the tax burden on households. Furthermore, it ignores the fact that the increased tax liability will generate additional capitalization effects, with the results that the actual effect will be less than \$3,400.

Table 1
Capitalization of State Aid Distributed by
a Power Equalizing Formula

	Community A	Community B
Property wealth per pupil	\$40,000	\$60,000
Tax yield per 1.00% tax rate	400	600
Power equalizing per 1.00% tax rate	500	500
Tax rate	3.00%	3.00%
State aid	\$ 300	0
Pre-power equalizing expenditure per pupil	1,200	\$ 1,800
Post-power equalizing expenditure per pupil	1,500	1,800
Full capitalized value of state aid	3,394	0
Post-capitalization property wealth per pupil	43,394	60,000
Post-capitalization tax liability at 3.00%	1,302	1,800

The method of calculating the capitalized value of state aid is described in the latter part of Appendix A. In this method, state aid is considered an addition to annual rent, which is an approximation of the discounted return that the owner could have received by investing the wealth in the next best alternative. In this example, annual rent is \$3,531 in Community A and \$5,197 in Community B.

A variation of the case above occurs if the power equalizing formula contains a recapture provision. Table 2 shows figures for the case in which all revenues above the guaranteed value are recaptured: Community B receives a negative \$300 per pupil in state aid and incurs a fiscal deficit, whereas Community A again has a fiscal surplus of \$300 per pupil. The state aid is capitalized in both communities resulting in an increase in the property wealth per pupil in Community A of approximately \$3,400 and a decrease of a similar magnitude in Community B.* Tax liabilities in both communities also move in the same direction as property wealth per pupil. An interesting implication of this situation is that, if the two communities are taken together, there is no increase in total wealth since the aid system change is self-financing. In the previous situation there was an increase in wealth which was due to an injection of aid. However, this program of aid will not cost the state anything in

*The small difference in the negative and positive capitalized values is due to rounding.

Table 2
Capitalization of State Aid Distributed by a
Power Equalizing Formula With Recapture Provision

	Community A	Community B
Property wealth per pupil	\$40,000	\$80,000
Tax yield per 1.00% tax rate	400	800
Power equalizing per 1.00% tax rate	500	500
Tax rate	3.00%	3.00%
State aid	\$ 300	\$ -300
Pre-power equalizing expenditure per pupil	1,200	1,800
Post-power equalizing expenditure per pupil	1,500	1,500
Full capitalized value of state aid	3,394	-3,399
Post-capitalization property wealth per pupil	43,394	56,601
Post-capitalization tax liability at 3.00%	1,302	1,698

succeeding years as the aid payments per pupil to Community A decrease by \$34 per pupil and the amount recaptured from Community B also will decrease in succeeding years.

Some states use a foundation aid formula for distributing monies to school districts. An example is described in Table 3. This formula has three factors that can be manipulated: the foundation level, which is \$1,000, the state's share, which is .5, and the foundation property wealth per pupil, which is the denominator in the adjustment factor and is set equal to \$50,000. Thus, if a school district had property wealth per pupil of \$50,000, it would receive \$500 per pupil in foundation aid.

In this example, Community A receives \$600 per pupil in foundation aid and Community B receives \$200 per pupil. If both communities tax property value at three percent, Community A spends \$1,800 per pupil and Community B spends \$2,000 per pupil. The state aid is capitalized in both communities resulting in an increase in property wealth per pupil of \$6,792 and \$4,530 in Community A and Community B, respectively. As a result, the post-capitalization tax

Table 3
Capitalization of State Aid Distributed by
a Foundation Formula

	Community A	Community B
Property wealth per pupil	\$40,000	\$60,000
Tax yield per 1.00% tax rate	400	600
Foundation required tax effort	1.00%	1.00%
Foundation level	\$ 1,000	\$ 1,000
Tax rate	3.00%	3.00%
Foundation (state) aid	\$ 600	\$ 400
Pre-foundation expenditure per pupil	1,200	1,800
Post-foundation expenditure per pupil	1,800	2,200
Full capitalized value of state aid	6,792	4,530
Post-capitalization property wealth per pupil	46,792	64,530
Post-capitalization tax liability at 3.00%	1,404	1,936

liability increases by \$204 per pupil in Community A and by \$136 in Community B, and in succeeding years, the dollar amount of state aid also will decrease in both communities.*

It should be noted that the dollar values of capitalization are specific to the examples. Further, the capitalization of state aid may not be as straightforward as presented here. Communities may be taxed in other ways to pay for the state aid that could reduce or eliminate the fiscal surplus.

A final example is that of a flat grant. Communities are not required to spend these funds on education, but may use them to reduce taxes. Table 4 lists the profile of a \$500 per pupil flat grant used to reduce taxes. Both communities decide to keep education spending at the old level. Thus, Community A can reduce the property tax rate from three percent to 1.75 percent and Community B can reduce its property tax rate to 2.17 percent. The tax reduction is capitalized in both communities: property values increase \$6,598 in Community A and \$6,227 in Community B. If both communities decide to maintain the reduced tax effort, the new tax liability plus the

*It is obvious that the capitalized effects assume that this is not a closed system, but rather that there are families moving in and out.

flat grant will lead to an increase in education spending per pupil in both communities. Conversely, they could continue to support education at the same level with the tax effort reduced even further.

One additional point needs to be emphasized. The capitalization effects described only occur if a sufficient number of households sell their property. Those who sell experience capital gains or losses, whereas those who don't simply incur the new tax liability. It is not necessary that everyone sell, but only a sufficient number since reassessments should follow market signals.

Table 4
Capitalization of State Aid Distributed
by a Flat Grant

	Community A	Community B
Property wealth per pupil	\$40,000	\$60,000
Tax yield per 1.00% tax rate	400	600
Tax rate	3.00%	3.00%
State aid (flat grant)	\$ 500	\$ 500
Pre-aid expenditure per pupil	1,200	1,800
Post-aid expenditure per pupil	1,200	1,800
Post-aid tax rate	1.75%	2.17%
Full capitalized value of tax rate reduction	\$ 6,598	\$ 6,227
Post-capitalization property wealth per pupil	46,598	66,227
Post-capitalization tax liability at post-aid tax rate	815	1,437

The hypothetical cases above are supported by Vincent and Reinhard's simulation results of school finance reform in California for several districts. Incorporated into the simulation were increased state aid and a recapture mechanism. Increased state aid did not raise expenditures per pupil but was reflected in decreased property tax levies.

As indicated in Table 5, not incorporating capitalization effects underestimates the expected change in assessed valuation per pupil. Assuming 60 percent capitalization, the extent of underestimation ranges from about 3 percent for the Burlingame school district

Table 5
Results of Simulating Impacts of Capitalization Within the California School
Finance Simulation Model (1980-81)

School District	Assessed Value/per Pupil			State Aid per Pupil Increase (+) or Revenues Recaptured per Pupil (-)			Expenditure per Pupil
	Base ^a	100% ^b	60% ^c	Base	100%	60%	
Burlingame	\$202,825	\$206,122 (+ 1.6%)	\$209,500 (+ 3.3%)	\$-166	\$-170	\$-174	\$1,913
Jefferson	43,295	51,655 (+ 19.3%)	50,054 (+ 15.6%)	+ 72	+ 44	+ 50	1,724
Laguna Salada	39,104	43,285 (+ 10.7%)	43,478 (+ 11.2%)	+ 37	+ 31	- 31	1,628
Redwood City	86,178	99,033 (+ 14.9%)	97,638 (+ 13.3%)	- 13	- 22	- 21	1,737
San Mateo City	86,516	97,496 (+ 12.7%)	96,066 (+ 11.0%)	- 17	- 26	- 25	1,763
South San Francisco	62,191	70,546 (+ 13.4%)	70,851 (+ 13.9%)	- 37	- 52	- 53	1,918

^a These are the Base Case estimates and do not incorporate the effects of capitalization.

^b These are based on the estimates that assumed 100% capitalization.

^c These are based on the estimates that assumed 60% capitalization.

Source: Based on Vincent and Reinhard (1979), Tables 8 and B-4.

(\$209,500 instead of \$202,825) to almost 15 percent for the Jefferson school district (\$50,054 instead of \$43,295). If 100 percent capitalization is assumed, the extent of underestimation ranges from about 2 percent in Burlingame to approximately 19 percent in Jefferson. The percent change in property values per pupil tends to be lower for wealthier school districts than for poorer school districts because the recapture of excess tax yields — a relative increase in taxes — outweighs the incremental change in school expenditures. However, Laguna Salada's property values increase by a relatively small amount because its expenditures per pupil are still relatively low. Perhaps even more importantly, payments to poorer school districts are overestimated (by \$6 per pupil in Laguna Salada in 1980-81) and the number of dollars recaptured from wealthier districts is underestimated (by \$15 per pupil for South San Francisco in 1980-81).*

Table 6 lists the differences in projected state aid and recapture levels for 1980-81 by including capitalization. The total cost of school finance reform for the Jefferson school district is reduced by over \$617,500 and by more than \$295,000 for the South San Francisco school district. Capitalization reduces the cost of school finance reform for just these six districts by \$1,694,000 relative to the Base Case projections, an average reduction of \$40 per pupil.

Although capitalization itself is not a policy tool, it warrants consideration because its effects may change perceptions toward certain policies. For instance, in the above case, capitalization does not lead to equal expenditures per pupil across all school districts but it results in a diminution of the differential. Further, it does not result in equal tax rates for all taxpayers, (although full capitalization results in horizontal equity when the price paid is expanded to include the price of housing and the tax liability.) Even with recapture of excess tax yield, the real tax effort required in Burlingame, assuming 60 percent capitalization, is \$9.39 per \$1,000 of assessed valuation, whereas in Laguna Salada the tax effort is \$15.68 per \$1,000 of assessed valuation. These calculations include state aid and recaptured tax revenues. For example, Burlingame spent \$1,913 per pupil and \$54 per pupil was recaptured. Thus, Burlingame needed to raise \$1,968 per pupil which required a tax liability of \$9.39 per \$1,000 of assessed valuation. Laguna Salada needed to raise \$681 per pupil (\$1,253 - \$572), which required a tax effort of \$15.68.

*It should be noted that simulating the capitalization effects of school finance reforms using pre-reform fiscal characteristics to estimate the capitalization coefficients may introduce measurement errors. The distribution of post-reform fiscal characteristics are likely to differ with the result that the capitalized effect should also differ. For example, consider the case in which the estimate does not incorporate other public services, which are correlated with school spending in the pre-reform situation. The reform may weaken this correlation, thereby reducing the magnitude of post-reform capitalization.

Table 6
Differences in Projected State Aid and Recapture Levels
by Including Capitalization Effects (1980-81)

School District	Total Dollars Distributed by State (-) or Recaptured from District (+) per Pupil ^a			Pupils
	Base ^b	100% ^c	60% ^d	
Burlingame	\$+ 46	+ 50	+ 54	1,908
Jefferson	- 612	- 496	- 518	6,529
Laguna Salada	- 635	- 574	- 572	5,185
Redwood City	- 125	- 104	- 106	6,931
San Mateo City	- 112	- 93	- 96	10,243
South San Francisco	- 102	- 77	- 75	11,054

^a Calculated as the negative sum of foundation program aid and State Teachers' Retirement System aid, plus guaranteed yield or minus recapture.

^b These are the Base Case estimates and do not incorporate the effects of capitalization.

^c These are based on the estimates that assumed 100% capitalization.

^d These are based on the estimates that assumed 60% capitalization.

Source: Based on Vincent and Reinhard (1979), Table 9.

Capitalization and Fiscal Capacity

As demonstrated in the second case above, if state aid to some districts is financed solely by revenues recaptured from other districts, and if these two exactly offset each other, the capitalized values of benefit and tax changes will offset each other. It might be concluded that what is actually described is a zero-sum game. This is the basis of Bish's (1976) argument that redistribution of funds (recaptured funds which finance state aid) does not increase the fiscal capacity — the property wealth of school districts — of all school districts taken together.

Another way of viewing this is that the price of education has decreased in Community A, from \$1 per tax dollar to \$.80 per tax dollar, but the price of housing has increased commensurately. Conversely, in Community B, the price of education has increased from \$1 per tax dollar to \$1.20 per tax dollar, but the price of housing has increased commensurately. Thus, although prices of the two goods — education and housing — have changed, the changes exactly offset each other. Because residents in each community must pay the same total bill for the two goods after the change in financing as

they did before, the program does not necessarily promote equal education opportunity.

However, a program such as district power equalizing with recapture under some circumstances may increase wealth. If benefits are distributed mainly to low wealth residents and costs are increased mainly for high wealth residents, not only is the distribution progressive, but it also may increase total wealth.* However, this requires that the extent of capitalization be related to the initial level of benefits and taxes. For if the extent of capitalization is independent of starting levels, equal benefit and cost changes will offset each other (assuming the same degree of capitalization). For example, Meadows' results implied that increasing public school expenditures by \$100 increased property values by \$3,500, independent of the level of original expenditures; and increasing the property tax by one percent decreased property values by \$4,200 irrespective of the tax rate. Oates' results, on the other hand, implied that increasing public school expenditures increased property values, but at a decreasing rate as the expenditure increased. Thus, using Oates' coefficient for public school expenditures, an increase in public school expenditures from \$1,200 to \$1,500 will increase property values by \$1,090, but a decrease in expenditures from \$1,800 to \$1,500 will decrease property values by \$890. Thus, this redistribution can actually increase wealth.

Bish does assert, however, that the redistribution described above has a price effect. A price effect is defined as a change in the quantity purchased of an item due to its change in price. In this situation, price changes (for the community) because state aid alters the ratio of locally financed expenditures to total expenditures for education in a school district.** Thus, because of the price effect, education spending will be encouraged in districts in which its price has fallen and will be discouraged in districts in which its price has increased. Taking the second example above, the price of education falls from \$1 per tax dollar to \$.80 per tax dollar in Community A, but it rises from \$1 per tax dollar to \$1.20 per tax dollar in Community B. The quantity of education demanded can be expected to increase as price falls and decrease as price rises, thereby moving in the direction of equalizing expenditures.

*This requires that low income families live in low wealth communities and high income families live in high wealth communities. Moreo.er, as stated earlier, this statement is based on the findings of Oates, which are not definitive.

**Not all forms of state aid generate a price effect. A foundation program generates an income effect. This key distinction is that for the price effect to occur, state aid must be a function of the tax effort. This occurs under a power equalizing formula but generally not with a foundation program. For a more detailed discussion of this, see the recent ECS publication by Vincent and Adams (1978).

Another analytical perspective is available in a recent study that ranks seven school finance formulae according to three evaluation rules that political decision makers may use to select a school finance policy (Inman, 1978). The three rules typify a pro-middle class preference, a pro-poor preference and the equalizing influence of school finance reform on the region's distribution of education.

Using the New York City metropolitan school economy for 1968-69 as the data base, the study determined that district power equalizing with a recapture provision is the preferred school finance policy utilizing the pro-middle class evaluation rule, the minimum foundation program is the best given the pro-poor evaluation rule, and the minimum foundation program with a spending limit comes out on top when policies are ranked according to their equalizing impact on the region's distribution of education.

The study suggests that district power equalizing with recapture ranks last according to the third evaluation rule because capitalization and housing stock adjustments lead to a distribution of education expenditure not much different from the original distribution. This is because in less wealthy districts the policy decreases the marginal tax cost of education, which in turn increases the quantity of education consumed. However, the increase in education expenditures is capitalized positively into property values. As a result, the community's tax base increases in relation to the guaranteed tax base, thereby increasing the marginal tax cost, which in turn reduces the quantity of education purchased. district power equalizing does equalize education opportunity to some extent. Although the increase in education spending is less than originally envisioned, it is still greater than without the policy. (This relationship is described in more detail in Appendix C.)

The School Finance Problem

One point that has been raised in a number of school finance reform court cases is that property wealthy districts are able to provide high levels of spending for education at very low tax rates, whereas property poor districts have the short end of two sticks: low spending and high taxes. Bish (1976) questions the method of establishing this relationship. He states:

Analyses of the relationships among wealth, tax rates and expenditures that have been presented in school finance cases have been demonstrations of simple correlations between wealth and tax rates and between wealth and expenditures. The causal relationship postulated is that high wealth results in low tax rates and high expenditures, and conversely, that low wealth results in high tax rates and low expenditures. This assertion of causality implies that property value (wealth) is determined independently of property taxes or educational expendi-

tures. That is property values do not change in response to either taxes or expenditures, but taxes and expenditures change in relation to changes in wealth. This presupposition is critical to some of the important conclusions in education finance. This presupposition, however, is neither warranted by the major body of theory which treats property value determination — land rent theory — nor supported by empirical evidence on changes in property value in response to changes in property taxes or educational expenditures.

The capitalization of benefit and tax variations requires that the perspective on property wealth differences be altered. Specifically, if the relative advantages and disadvantages are fully capitalized, is the typical resident in the property wealthy district still advantaged?

To evaluate this, consider a broader definition of the price a resident pays to live in a community and to receive the benefits associated with it. Access to public education in a community is restricted to the residents. To receive the benefits, a family must purchase (or rent) housing in addition to paying taxes. Thus, the price of public services is the sum of housing costs and taxes.

Continuing along this line of reasoning, consider two typical houses that are identical except for the community in which they are located. One is located in a totally residential community in which the average value of property is \$50,000. The other is located in a highly industrialized community in which the average value of property is \$100,000. Both communities spend \$2,000 per child for public education, but the first community requires a tax effort of \$4 per \$100 of property value, whereas a tax effort of \$2 per \$100 of property value is required in the second community. Thus, the tax liability for the typical house in the first community is \$2,000, but only \$1,000 for the same house in the second community.

If the tax liability variation is fully capitalized at a discount rate of 10 percent, and if it does not affect the choice between education and other goods and services, then the identical houses would command a price of \$50,000 in one community and \$60,000 in the second community. The end result would be that if a family were trying to choose between these two communities to obtain the level of public education, the price paid for access would be exactly equal. The second community — with the lower tax effort — would be just as costly as the first. The price of access over the course of the benefits is as follows:

First Community	$\$50,000 + \$2,000/.10 =$
	$\$50,000 + \$20,000 = \$70,000$

Second Community	$\$60,000 + \$1,000/.10 =$
	$\$60,000 + \$10,000 = \$70,000$

Full capitalization of a tax variation results in horizontal equity, which is defined as paying the same price everywhere for the same goods in the post-tax state. Thus, a simple correlation of wealth and taxes may lead to unwarranted conclusions about the real price that is paid for access to public services.*

The concept of horizontal equity does not mean that all variations in property wealth can be explained by tax and expenditure capitalization. Instead, it suggests that if all other things are equal, low tax rates or high benefit levels may not represent an unfair advantage.

Windfall Gains and Losses: Efficiency and Equity Considerations

The capitalization of benefit and tax variations not only raises questions about the "having your cake and eating it too" attitude towards property wealthy districts, it also raises a serious political question about the effects of school finance reform. Specifically, the notion of winners and losers extends beyond simple state aid increases or decreases, but encompasses the problem of "windfall gains and losses" to residents of the affected communities. There is no definitive answer, as yet, to this issue. There are several perspectives, such as efficiency or equity, which one may take, however.

The efficiency perspective primarily is one of future behavior. That is, previous decisions already have been made and to make future decisions in order to compensate for past decisions would result in a waste of resources (Mishan, 1972). By analogy, consider the case of a regulated company which has invested in a plant and has operated it for some time. Assume that the regulatory agency permits another firm to produce a similar product in the area because it can do it at a lower price, which makes the original plant unprofitable. The firm has not received a guarantee from the agency that it would always make a profit. Instead, the agency takes the viewpoint that past decisions represent sunk costs and that future efficiency is the germane criterion for decision making.

Society has not guaranteed the homeowner that the value of property will not decrease in value just as it has not guaranteed the homeowner a predetermined rate of return. If current decisions are made to ensure the viability of past decisions, an income transfer is

*The example presented ignores the possibility that the industrial base of the city may affect property values in other ways relative to some other community. For instance, industrial wastes may reduce the quality of life, add to the cost of home maintenance, and therefore, lead to reduced property values.

taking place which may not be desirable from a number of perspectives. Further, school finance reform does not occur in a vacuum nor does it occur spontaneously. But concern with potential windfall losses and gains may become another decision-making criteria for the enactment of reform. Moreover, the magnitude of the losses or gains also is a function of the discount rate. If there is any uncertainty as to the prospects for the asset maintaining its relative advantage, the individuals could discount future benefits at a higher rate. For instance, future benefits of \$1,000 per year discounted at 10 percent are valued at \$10,000 today, but if they are discounted at 20 percent, they are valued currently at \$5,000. Thus, the efficiency perspective would not suggest any policy to deal with this issue, but probably would argue that the market affords methods to accommodate it.

The equity perspective takes the view that it is not appropriate that certain households experience windfall gains and others windfall losses.* The argument is that some current residents have paid for a stream of advantages which they will not receive, whereas others have not paid for them but will receive them or may choose to sell them to others at the discounted present value of the future benefits.

Newacheck (1979) suggested that reform be phased in over a number of years so that the capitalization effects would occur more slowly. To do so would reduce the magnitude of the capitalization effect, but would not eliminate it. Capitalization is based on expectations. If a changed future stream of benefits or taxes are expected, they will be capitalized irrespective of the timing of implementation. Thus, the distributional aspects will not differ, but phasing in may reduce the magnitude of the gains and losses to an acceptable level.

Windfall losses may be objectionable and windfall gains also may be considered inequitable, but programs designed to eliminate them may be impossible to implement and manage and may have even greater consequences. For instance, assume that the state decides to tax at 100 percent all windfall gains and uses this fund to compensate for windfall losses. First, such a program may be unmanageable. Second, it could reduce mobility. Presumably, residents of communities that have won in the state aid allocation reform, but who were satisfied with the previous combination, would consider

*The equity perspective may not object to the windfalls if all gains are realized by low income families and all losses are suffered by high income families; but income classes tend to be randomly distributed through communities. Thus, low income individuals, who have made substantial sacrifices to live in property wealthy communities — and to receive the public services — may suffer relatively severe capital losses.

moving. But if there is no cost to staying and little benefit from moving, since part of the impetus to move comes from the possible capital gains, mobility could be reduced. As a result, it may be more difficult to match family preferences with communities. The magnitude of this program depends on the type of reform proposed.

In summary, adoption of the efficiency perspective may thwart the enactment of school finance reforms because some households — perhaps politically important ones — would be experiencing losses. Adoption of the equity perspective may lead to some distribution problems and may thwart attaining the objectives of reform.

Property Tax Reform

The previous section has demonstrated that state aid to schools actually may expand the tax base and therefore, not be as expensive as originally considered. By the same token, property tax reduction need not reduce tax revenues by the same amount as the tax relief. As demonstrated, a \$500 flat grant to the two communities resulted in a post-capitalization increase in tax liability of \$115 in Community A and \$135 in Community B.

The most prominent example of property tax reform, Proposition 13 in California, rolled back property taxes to one percent of 1975 fair market value and limited yearly increases in assessments to two percent unless the property is sold. Given these conditions, will capitalization occur? If so, who will benefit? Homeowners who continue to own their homes have their taxes reduced but experience no capital gains. Households that sell their property should realize a capital gain, but the knowledge that the assessment will not be limited may actually be capitalized negatively into the value of property. As a result, the property values may be less than they would have been without the impact of Proposition 13. Further, there is the possibility that properties in some depressed areas will have an increased tax liability, thereby depressing prices even further. Another possibility is that mobility will be reduced. If this occurs, the tax reductions will not be capitalized, since property must change hands for it to occur, and tax revenues may decline by the full amount of tax relief.

In addition to reducing taxes, some states have limited expenditures and others have passed tax ceilings or other restrictions on property tax rates. Although these policies appear to be opposite sides of the same coin, they have different ramifications for property values. To analyze these differences, assume two districts, one with an expenditure limit (Community A) and the other with a tax limit (Community B). Suppose that both districts have an equalized assessed value

of \$25 million, each district spends \$1 million in the first year, all revenues are raised through the property tax, all revenues raised are spent, and both districts are equally efficient.

Assume the tax rate is four percent. In Community A, expenditure increases are limited to a predetermined value, say seven percent, but property values increase by an amount greater than that value. If property values increase by 10 percent, assessed value increases to \$27,500,000, but expenditures are permitted to increase to \$1,070,000. Thus, the new tax rate in A is 3.8 percent. Conversely, assuming that property values increased by 10 percent in B also, the new level of expenditures, given a tax rate of four percent, is \$1,100,000. The effective tax rate and level of expenditures now differ in the two communities.

If the increased expenditures in B purchase additional public goods that residents feel are in short supply, the increased benefits will be capitalized into property values. However, if residents of B do not feel that the public goods purchased are in short supply, they will have the incentive to move to the community with the lower tax rate. Thus, the tax differential will be capitalized.

Conclusion

As policy makers and voters consider additional state aid to public education and property tax reductions, they should take into account the capitalization effects. Increased spending for schools may increase property values in some districts, but some districts may suffer a reduction in property values either because they have had their aid reduced or they have had to increase their tax effort to maintain the old level of support. Depending on the number of districts which win or lose and the magnitude of the capitalization effects, initial estimates of the cost may be overstated as additional revenues are generated from the increased property values. Not only are changed expenditure levels capitalized, but variations in tax liabilities and tax rates are capitalized when these variations are relatively inexpensive to determine, such as municipal mill rates or legislative mandates to alter assessment ratios on a particular subset of property. Tax variations are not necessarily capitalized when they result from subtle differences in assessment ratios, which may be random and may be of uncertain duration.

The capitalized values presented here are illustrative. They document the experience of several regions; but the trend is unmistakable. The magnitude of capitalization depends on the preference families have for education and the number of communities satisfying it. Therefore, determining the exact value resulting from variations in education spending or additional state aid requires a special procedure. The appropriate approach for a specific study is described in Section II.

Recognition of capitalization effects requires that some traditional attitudes be changed. Specifically, since property values are determined by relative spending and taxing levels, communities that appear to be advantaged are not necessarily so. If the advantages are fully capitalized, the access price (housing costs plus taxes) to a level of benefits will be the same in the communities for the typical individual. Whereas the tax liability is greater in one community, the price of housing is greater in the other, and they offset each other. Therefore, high average property value does not guarantee an advantaged situation nor does a high tax liability assure a disadvantaged situation. Capitalization effects neutralize them.

However capitalization does raise the possibility that some households will experience windfall losses due to losing and others

may experience windfall gains due to winning in the school finance reform. The efficiency perspective would ignore this issue, whereas the equity perspective would attempt to adjust for the situation. The existence of this phenomenon raises an additional consideration for reform and may require that other implications of reform packages, such as the magnitude and distribution of capital gains and losses, be examined.

The equalizing capability of state aid distribution formulae is subject to debate. It appears that a power equalizing formula with a recapture provision does not expand fiscal capacity. This conclusion depends on the relationship between public school expenditures, taxes and property values. If the relationship is independent of current spending or taxing levels, the policy does not have a wealth effect; but if the relationship is dependent, then power equalizing distribution of aid with recapture may expand fiscal capacity by increasing property values of low wealth per pupil districts more than it decreases property values in high wealth per pupil districts. Thus, when the impacts on all school districts in a state are combined, the wealth per pupil may have increased. Probably the more important equalizing influence of the policy is the price effect, since it alters the marginal tax cost of purchasing additional education. However, researchers and policy analysts must look beyond the immediate price effect. Although power equalizing lowers the price of education in relation to other goods, after additional adjustments are made the price effect may be smaller than that indicated by the first adjustment. However, it still has some equalizing impact. Furthermore, capitalization may not be the appropriate vehicle to equalize education opportunity.

What does this all mean for policy makers? First, they need to look at their own city, region or state. Do families prefer more and better education? If they do, then variations in education benefits probably are capitalized, but the exact magnitude differs by region and needs to be calculated. However, the most important feature to be cognizant of is second-round adjustments: increasing state aid to education leads to higher property values that generate increased tax receipts that reduce the original cost of the state aid program. The chain is similar for property tax relief. As Vincent and Reinhard reported for one region in California, incorporating capitalization reduced the cost of additional state aid to education by approximately \$40 per pupil, a 15 percent savings.

Appendix A

A formal definition of capitalization is that it is the incorporation of the discounted present value of the future stream of changed costs or benefits associated with an asset. The discounted present value is calculated as follows:

$$PV = X/(1+r)^1 + X/(1+r)^2 + \dots + X/(1+r)^n = \sum_{i=1}^n X/(1+r)^i$$

Where PV is the present value, X is the monetized value of the cost or benefit, r is the discount rate, n is the number of years X is expected to occur, i is the current year and Σ is the symbol for summation. The discount rate is the rate at which current dollars are substituted for future dollars. A discount rate of 0.10 implies that a promise of \$1 next year is valued at \$.90 this year. The value of r depends on inflation, uncertainty and a person's time preference. Further, the present value is related inversely to the level of the discount rate. If costs or benefits are constant, begin immediately and are expected to continue indefinitely, the formula is: $PV = X/r$.

If we define the value of property without capitalization as V' , and if V'' represents the value with the capitalized benefit or cost, V'' is calculated as follows:

$$V'' = V' \pm \sum_{i=1}^n X/(1+r)^i$$

where the negative sign is associated with costs and the positive sign with benefits. For purposes of the discussion in Section I, the above formula is used. In Section III where specific examples are given, Oates' formulation (1969) is used. Oates calculates the capitalized value of a change in the annual rent derived from the property due to a change in benefits or taxes. This is done in the following manner:

$$V' = Y_m / (1+tm)$$

$$\text{where } Y = \text{annual rent; } m = \sum_{i=1}^n 1/(1+r)^i; \text{ and } t = \text{tax rate}$$

To calculate the capitalized value of a change (Δ) in benefits, compute the difference in the annual rent.

$$((Y+\Delta)m / (1+tm)) - (Ym / (1+tm))$$

To calculate the capitalized value of a change of the tax rate, use the following formulation:

$$Y_m / (1 + tm) - Y_m / (1 + t'm)$$

where t' = the new tax rate.

Appendix B

1. Tiebout, Charles M. "A Pure Theory of Local Expenditures." *Journal of Political Economy*, 64 (October 1956), pp. 416-424.

Capitalization is implicit in Tiebout's approach. His purpose is to show that the optimal quantity of locally provided public goods and taxes can be determined in a market context. Communities offer a specific combination of public goods and taxes, and consumer-voters go to the community whose combination matches their preferences.

Tiebout makes seven assumptions to get to this result. They are: (1) consumer-voters are fully mobile; (2) they have full information about revenue and expenditure patterns; (3) they can choose among a large number of communities in which to live; (4) employment requirements create no restrictions; (5) the provision of public services does not result in externalities between communities; (6) for every pattern of community services there is an optimum size; and (7) communities seek to achieve their optimum size.

At any given time, it is likely that not all consumer-voters will be in communities that are satisfactory to them. This disequilibrium situation may result from a supply restriction such as an insufficient number of communities providing the particular mix of goods and taxes desired. In the short term, the discontented consumer-voter may attempt to move into a community that is satisfactory by bidding a spot away from a current resident who does not have as strong a preference for this mix. In so doing the consumer bids up the price of the spot, the upper bound being the discounted present value of the future returns from the public goods and taxes. Thus, the presence of capitalization actually reflects a short-run disequilibrium situation due to some imperfection on the supply side.

2. Oates, Wallace E. "The Effects of Property Taxes and Local Public Spending on Property Values: An Empirical Study of Tax Capitalization and the Tiebout Hypothesis." *Journal of Political Economy*, 77 (November-December 1969), pp. 957-971.

Oates incorporates capitalization explicitly into the analysis of the consumer-voter. Through capitalization of public expenditures, taxes and property values form a simultaneous system in which expenditures and taxes feed back on property values rather than property values being determined independently of taxes and expenditures. If a community's taxes are raised and the increased revenues are expended on public goods and services, the

property wealth of the community need not decline but may actually increase. As Oates (p. 959) states, "It is the present value of the future stream of benefits from the public services relative to the present value of future tax payments that is in this case important."

Oates' study also represents the first empirical assessment of the Tiebout hypothesis. He regresses the median value of owner-occupied dwellings in 53 communities in New Jersey on the annual expenditure per weighted pupil in public schools and the effective tax rate. He also controls for other factors affecting property value such as the median number of rooms per house, the percentage of houses constructed since 1950, median family income, the distance in miles from Manhattan, and the percentage of families in the community with an income of less than \$3,000 per year. Using both ordinary least squares and two-stage least squares, the coefficient on annual expenditures per weighted pupil in public schools is statistically significant and positive and the coefficient on the effective property tax rate is statistically significant and negative.

Both the effective tax rate and the expenditures per pupil are entered in log form. The implication of this is that the dollar capitalized value depends on the level of expenditures or taxes. For example, an increase in expenditures per pupil from \$350 to \$450 results in an increase of \$1,200 for an average property. A change from \$550 to \$650 increases the value of an average property by \$800. Thus, the exact functional form of the relationship has important implications for the wealth effect of school finance reform.

Oates also discusses a problem with his approach due to using cross-sectional observations: it implicitly assumes that the observations represent equilibrium points. However, the capitalization of variations in benefits and taxes actually represents short-run disequilibrium positions. Oates does not assert that his results indicate a Tiebout equilibrium; he contends that his results are consistent with a Tiebout-like system.

3. Pollakowski, Henry O. "The Effects of Property Taxes and Local Public Spending on Property Values: A Comment and Further Results." *Journal of Political Economy*, 81 (July-August 1973), pp. 994-1003.

Pollakowski attempts to replicate Oates' results for the San Francisco region. Using Oates' specification, the coefficient on the tax variable is statistically significant and negative, but the expenditure per pupil variable is not statistically different from zero. Neither variable is significant in an alternative specification in which distance, mean family income and percentage low income families are deleted. Pollakowski criticizes the use of only one category of expenditures to represent the package of local government services. If the level of expenditures for public education is high, are expenditures for other public services high or low? Are levels of public services complementary or are they substitutes? This question should take on greater theoretical and

empirical importance in the future. As communities and states pass tax and expenditure limitations, the public budget no longer will be expandable to handle all demands from consumer-voters. Bargaining between interest groups may result in trade-offs between, say, education and sanitation.

4. Oates, Wallace E. "The Effects of Property Taxes and Local Public Spending on Property Values: A Reply and Yet Further Results." *Journal of Political Economy*, 81 (July-August 1973), pp. 1004-1008.

Oates addresses Pollakowski's criticisms concerning the package of public goods by including another variable serving as a proxy for the level of all other public services in the estimation equation. The coefficient of this variable is positive and significant and does not alter the sign and statistical significance of the two other key variables under consideration. Furthermore, Oates clarifies the implication of his results for the Tiebout hypothesis. There are at least some families who are sensitive to fiscal differentials. All that is required for capitalization to occur is that there be a sufficient number of families who take fiscal variables into consideration so that any differential fiscal benefits (positive or negative) among communities in the same general area are offset through adjustments in the value of local property. If this is true, it means that models of the Tiebout type do possess positive or predictive power in evaluating the effects of various local fiscal programs.

5. Edel, Matthew and Elliot Sclar. "Taxes, Spending, and Property Values: Supply Adjustments in a Tiebout-Oates Model." *Journal of Political Economy*, 82 (September-October 1974), pp. 941-954.

Edel and Sclar address the distinction between short-run adjustments and the long-run Tiebout equilibrium. They are skeptical of Oates' earlier results, arguing that the results only verify that consumer-voters conform to Tiebout's expectations, but that the results are due to short-term supply effects. Rather, they assert that, in the long-run equilibrium for all public goods and tax burdens, no capitalization occurs. Edel and Sclar ignore the simultaneous relationship among benefits, taxes and property values. This omission is not surprising because they are concerned with a long-run solution. The basis of the simultaneous relationship is capitalization. If long-run equilibrium is achieved, there is no capitalization and property values are independent of fiscal variables.

They offer an empirical test to determine whether a long-run Tiebout equilibrium was being approached in the suburbs surrounding Boston. They regress median house value on nominal tax rates, school expenditures per pupil and highway maintenance expenditures per square mile. Control variables include measures of distance and accessibility to the central business district, population density and the percentage of owner-occupants

among residents of the community. Separate regressions were tested for 1930, 1940, 1950, 1960 and 1970. Because the value of the coefficient for school expenditures per pupil decreased from 1950 to 1970, Edel and Sclar argue that public schooling approaches a Tiebout equilibrium, whereas the coefficients on nominal tax rates indicate that not all local services are in equilibrium. Their interpretation does raise the question of what distinguishes a Tiebout equilibrium — no capitalization — from the situation in which none of the public goods included in the specification are arguments in the utility function of the marginal consumer.

6. Hamilton, Bruce W. "The Effect of Property Taxes and Local Public Spending on Property Values: A Theoretical Comment." *Journal of Political Economy*, 84 (June 1976), pp. 647-650.

Hamilton points out that the relationship between capitalization and Tiebout equilibrium needs to be redefined. The question is not whether consumers are sensitive to a set of predetermined fiscal variables such as expenditures per pupil. Rather, are consumers sensitive to activities that are in short supply in the short run? Oates' and Pollakowski's results are not contradictory. Instead, communities providing high levels of expenditures per pupil are in short supply in New Jersey, but such communities are not in short supply in San Francisco.

As Hamilton discusses, it is possible that fiscal slums, communities with high tax rates and low public expenditures, are in short supply given the tastes and preferences of consumers and that these characteristics are capitalized positively into the value of the property. Hamilton broadens the source of capitalization, including the following two factors: (1) disequilibrium due to an incorrect matching of communities and consumer-voter preferences, and (2) "persistent systematic differences in production functions either for raising revenue or producing services."

7. Meadows, George Richard. "Taxes, Spending and Property Values: A Comment and Further Results." *Journal of Political Economy*, 84 (August 1976), pp. 869-880.

Meadows takes the Edel and Sclar model as the starting point and corrects several deficiencies. According to Meadows, Edel and Sclar err by ignoring the possibility of reverse (simultaneous) causality between property values, property tax rates and local expenditures, thereby not accounting for Tiebout-relevant indirect impacts on property values. Meadows divides the possible capitalization effects into full effects and partial effects, arguing that the Tiebout equilibrium requires that the full effect be equal to zero.

Meadows specifies a four-equation model in which the endogenous variables are the median value of owner-occupied dwellings (V), equalized property tax rates for all local services including education (T), weighted school expenditures per pupil (operating and debt service) (E_s), and municipal expenditures per resident

(Em). Each endogenous variable was regressed on a set of exogenous variables plus the appropriate endogenous variable. The partial effects correspond to regression coefficients and the full effect is measured by the simultaneous interaction of the partial effects. For example, the full effect of a change in taxes on property values is equal to the partial effect of a change in taxes on property values, plus the product of the change in school expenditures on property values and the change in taxes on school expenditures, plus the product of the change in municipal expenditures per resident on property values and the change in taxes on municipal expenditures per resident.

Using Oates' sample of New Jersey cities with observations for 1960 and 1970, Meadows finds statistically significant coefficients and in the correct direction for the partial capitalization effects. He determines that the partial effects for 1970 are smaller than those for 1960. Further, the "first approximation" of the full effect is smaller than the partial effects. As Meadows states, "This observed diminution of differential capitalization implies that these communities are closer to the Tiebout result than is otherwise implied."

8. Inman, Robert P. "Micro-Fiscal Planning In the Regional Economy: A General Equilibrium Approach." *Journal of Public Economics* 7 (April 1977), pp. 237-260.

Inman analyzes capitalization of taxes and public benefits (both school and general expenditures) in a general equilibrium model of a regional economy. Inman incorporates capitalization into his model because "By ignoring capitalization and investment feedbacks our simple demand equation models of local fiscal behavior will give us prediction errors for the long-run effects of aid."

Inman includes the attractiveness of alternative communities in his theoretical specification. However, due to the extreme computational cost of including measures of the fiscal attractiveness for all possible alternative communities in a regional economy, his empirical specification does not include these variables. Instead, his model is very similar to that of Oates. Using the New York City metropolitan school economy for 1968-69, Inman determines that local school expenditures and town expenditures on other services are positive and statistically significant causes of variation of median home values, and the local school plus own tax rate is negative and statistically significant.

9. Rosen, Harvey S. and David J. Fullerton. "A Note on Local Tax Rates, Public Benefit Levels, and Property Values." *Journal of Political Economy*, 85 (April 1977), pp. 433-440.

Rosen and Fullerton investigate the extent to which capitalization of benefits depends on the proxy measure used. Benefits generally are outputs — good police protection, well-maintained roads, quality education; but variations in benefit levels have been measured by inputs such as expenditures per pupil rather than achievement scores. Rosen and Fullerton offer three reasons

for the inadequacy of expenditures as a measure for the quality of schooling: (1) input prices may differ across communities, (2) education production functions may differ by community, and (3) the quality of nonschool education inputs (environmental factors) may vary by community.

Utilizing a sample of New Jersey communities very similar to that studied by Oates and employing two-stage least squares on 1970 data, they determine that the coefficient of achievement test scores is statistically significant and positive in all estimates, whereas the coefficient of expenditure levels per pupil is not significant, holding other factors constant. On the basis of their estimates they determine that median property values increase by \$4,300, if the achievement test scores of the public schools are in the top decile relative to the bottom decile, holding other factors constant. Conversely, expenditures per pupil are not capitalized. Further, by using an output measure rather than an input measure, the tax capitalization ratio is 88 percent relative to approximately 75 percent.

10. King, A. Thomas. "Estimating Property Tax Capitalization: A Critical Comment." *Journal of Political Economy*, 85 (April 1977), pp. 425-431.

King argues that Oates' test of the Tiebout model hypothesizes capitalization of the tax burden — the product of tax rate and property value — rather than the tax rate. Using the tax rate requires the assumption that the capitalized value of taxes is constant, irrespective of the value of property, whereas the tax burden measure varies by value of property. He asserts that Oates incorrectly estimated tax capitalization, resulting in an overestimate for low value properties and an underestimate for high value properties. However, using the tax burden measure requires that the dependent variable be redefined to avoid biased estimates.

11. Linneman, Peter. "The Capitalization of Local Taxes: A Note on Specification." *Journal of Political Economy*, 86 (June 1978), pp. 535-538.

Linneman criticizes some of the empirical tests of the Tiebout hypothesis, contending that appropriate empirical estimation requires that the government budget constraint be incorporated. For example, if the model of government budget allocation is constrained to spend additional tax revenues (due to a tax increase) on a dollar for dollar increase of public expenditures, appropriate estimation is impossible because public expenditure is a linear combination of the tax variable, resulting in a singular data matrix. Furthermore, under alternative conditions of governmental efficiency, variations in the tax variable need bear no relationship to variations of property values.

12. Hamilton, Bruce W. "Capitalization of Intra-jurisdictional Differences in Local Tax Prices." *American Economic Review*, 66 (December 1976), pp. 743-753.

Hamilton asserts that the difference between public goods received and tax liability incurred is capitalized. His analysis postulates a set of homogeneous communities, some containing only high income housing (HIH) and others containing only low income housing (LIH). Within every community, the distribution of public services (X) is equal for each household, although (X) varies across communities. Further, a proportional tax (t) is levied on each household generating tax revenues (tB) equal to the cost of public services. The proportional tax is equal to the ratio of public services to tax base (B), $t = X/B$. In homogeneous communities, there are no fiscal surpluses or deficits.

Hamilton also considers a mixed community composed of both low income housing and high income housing. Assuming that all households receive the same level of public service, (X), and given that the proportional tax (t) is calculated on the basis of the mean value of the housing stock, low income housing units accumulate a fiscal surplus and high income housing units incur a fiscal deficit. Due to the capitalization of the fiscal surpluses and deficits, the value of LIH units in a mixed community increases relative to the value of LIH in a homogeneous community and the value of HIH units in the mixed community decreases in value relative to the value of HIH units in a homogeneous community. Further, because all capitalization occurs on the value of land, the value of a LIH unit of land will be greater than the value of a HIH unit of land in a mixed community.

The magnitude of the fiscal surplus depends on the relative share of LIH and HIH in the community. The fiscal surplus for LIH decreases as its share of the community housing stock increases. For example, assume a community has four households, one LIH and three HIH, and further assume that the value of a LIH unit is \$20,000 and the value of a HIH unit is \$60,000. Assume that each household receives \$5,000 worth of public services. The mean value of the housing stock is \$50,000 and the tax rate is 10.0 percent. At this tax rate, the LIH incurs a \$2,000 tax liability. Thus, the fiscal surplus ($X - tL$, where L is the value of the low income house) for LIH is \$3,000 and the fiscal deficits for each HIH is \$1,000. Conversely, assume that the above community has two LIH units and two HIH units. The value of each type of unit is the same as above and each household still receives \$5,000 worth of public services. Given these conditions, the mean value of the housing stock is \$40,000, and the tax rate is 12.5 percent. At this tax rate the tax liability of the LIH units is \$2,500 and the tax liability of HIH units is \$7,500. As a result of increasing the proportion of LIH units, the fiscal surplus of the first LIH unit decreases from \$3,000 to \$2,500 and the fiscal deficits of the remaining HIH units increase from \$1,000 to \$2,500 per unit.

The process of capitalization in Hamilton's model is very similar to that in Tiebout's model. Consumer-voters are attracted by a fiscal surplus and are willing to pay a premium, the capitalized

value of the surplus, to obtain property having a surplus. Conversely, consumer-voters must be compensated to purchase the property having a deficit. The result is that consumer-voters entering the community are paying the same price for public services. Those purchasing a property with a fiscal deficit pay a lower price for the property, which exactly offsets the deficit. The converse holds for those purchasing a property with a surplus.

13. Lancaster, Kelvin J. "A New Approach To Consumer Theory." *Journal of Political Economy*, 74 (April 1966), pp. 132-156.

Lancaster sets the foundation for the characteristics (hedonic) approach. In his seminal article, he articulates three assumptions that distinguish his approach from the traditional method. The assumptions are (p. 134):

- a. The good, per se, does not give utility to the consumer; it possesses characteristics, and these characteristics give rise to utility.
- b. In general, a good will possess more than one characteristic, and many characteristics will be shared by more than one good.
- c. Goods in combination may possess characteristics different from those pertaining to goods separately.

14. Wales, T. J. and E. G. Wiens. "Capitalization of Residential Property Taxes: An Empirical Study." *The Review of Economics and Statistics*, 56 (August 1974), pp. 329-333.

Wales and Wiens estimate the extent of tax capitalization on residential property values in one municipality. By concentrating on one municipality, they circumvent the difficulty of accounting for different levels of public goods. Tax differentials arise from variations in the ratio of assessed value to market value even though tax rates are uniform in the same community. Thus, properties identical in all other respects have different tax liabilities. Controlling for housing, land and location characteristics of 1,800 sales of improved residential property in a municipality of the greater Vancouver area, they find no evidence of property tax capitalization. They may not have observed any tax capitalization because the variations in tax liability are difficult to ascertain and because there may be a high degree of uncertainty whether the differential, which is based on the deviation of the ratio of assessed value to market value from the average ratio, will persist for any length of time. To determine whether the ratio deviates from the average is not costless; it requires search and other information costs. The discounted present value of the expected savings may be less than the search and information costs.

15. Church, Albert M. "Capitalization of the Effective Property Tax Rate on Single Family Residences." *National Tax Journal*, 27 (March 1974), pp. 113-122.

Church utilizes a simultaneous equation model to estimate tax capitalization. His measure of tax variation is similar to that of Wales and Wiens. Market value of property and the effective tax rate are the endogenous variables. The market value of property is regressed on characteristics of the property and location and the effective tax rate for 957 single family homes in Martinez, California. Church uses principal components analysis to reduce the 90 characteristics of the property and location to a manageable number. The city also is broken into five neighborhoods to control for other possible influences. The coefficient of the tax variable is negative and statistically significant, but the values of the coefficient indicate that variations of the property tax are being overcapitalized.

16. Smith, Stafford R. "Property Tax Capitalization in San Francisco." *National Tax Journal*, 23 (June 1970), pp. 177-193.

Smith estimates the change in mean selling prices of single family homes due to an increase in the assessment ratio in a homogeneous community in San Francisco. Assessment ratios are increased in response to state legislation requiring that residential and nonresidential property be assessed at uniform rates. Since residential property tends to be assessed at a lower rate than nonresidential property, homeowners can expect an increase in their tax liability. Regressing the difference in the mean value of selling prices of houses sold prior to reassessment and then sold after reassessment on the change in tax liability, Smith finds a negative and statistically significant coefficient. However, this regression explains only 26 percent of the variation. There is the distinct possibility that the relationship represents a spurious correlation due to other factors not included in the regression equation.

17. Moody, James P. "Testing Tax Capitalization: An Experiment Afforded by a Local Public Transit Improvement." (Unpublished doctoral dissertation, University of California, Berkeley, 1974.)

Moody's study is a carefully controlled experiment in which individuals in two communities received an increase in a public benefit (Bay Area Rapid Transit), but only one community incurs an increase in tax liability. This is a clear case in which benefits received are not directly offset by tax liability. Moody regresses the asking price of a homogeneous set of residential properties derived from the Multiple Listing Services on a series of variables. The sample includes only single family, attached row houses with the following characteristics: two story, five room, two bedroom, one bath, garage attached, and lot size of 100 x 25 feet. Moreover, Moody does not assume that benefit levels are the same through the entire test area, but includes a measure to capture this. He determines that the point capitalization of the expected increase in taxes ranges from \$285 to \$478.

It should be noted that both Smith's and Moody's studies use the characteristics approach because they attempt to control for

characteristics of individual housing units by utilizing homogeneous units. The characteristics of the housing stock are not included explicitly in the regression equation.

18. Newacheck, Paul W. "Capitalization: The Price of School Finance Reform." *Policy Analysis*, 5 (Winter 1979), pp. 21-36.

Newacheck estimates property tax rate and expenditure per child capitalization for 47 school districts in the San Francisco Bay area for the 1969-1970 school year. His coefficient estimates are of the correct sign and statistically significant and indicate that each additional tax dollar increase per \$100 of assessed valuation reduces the value of the typical home by approximately \$1,700 and each additional dollar expenditure per child increases the value of the typical home by \$15. To place the tax capitalization estimate in perspective, the one percent tax increase represents an increased tax liability of \$73 for the typical house.

Newacheck uses the tax and expenditure capitalization results to simulate the effect of three school finance reforms. Only two districts receive an increase in expenditures if an \$800 expenditure floor is instituted and six districts experience expenditure capitalization with a \$900 floor. Under this latter program, property values increase from \$651 to \$2,325 for the typical home. When a district power equalizing plan is simulated, 21 districts experience expenditure and tax capitalization, nine of which are negative. In addition to the simulation, Newacheck also discusses a number of the policy implications of capitalization.

The difficulty of simulating post-reform capitalization effects based on pre-reform coefficient estimates is a salient criticism with Newacheck's study. The coefficient estimates are based on a distribution of fiscal characteristics; but these are pre-reform characteristics and the post-reform fiscal characteristics may form a very different distribution. The new distribution may generate a very different coefficient estimate. Furthermore, Newacheck has not accounted for differences in other publicly-provided services on the value of property. In the pre-reform situation, the level of expenditures per child and the level of other publicly-provided services may be highly correlated, and although the coefficient estimate is biased, it may not be critical. Reform may break the nexus between the categories of expenditures. To apply the pre-reform estimate to the post-reform situation may overestimate the increase in property values.

Appendix C

Inman (1978) suggested that district power equalizing with recapture ranked last according to the WEQ (equalizing impact on the distribution of education) evaluation rule because capitalization and housing stock adjustments lead to a distribution of education expenditure not very different relative to the original distribution. This stems from the fact that in less wealthy districts, district power equalizing decreases the marginal tax cost of education, which in turn increases the quantity of education consumed (Bish's price effect). However, the increase in education expenditures is capitalized positively into property values. As a result, the community's tax base increases relative to the guaranteed tax base, thereby raising the marginal tax cost, which in turn reduces the quantity of education purchased.

However, on the basis of Inman's marginal tax cost formula, it is apparent that district power equalizing does equalize education opportunity to some extent. Inman utilizes the formula,

$$\tau = \pi(1-m)B_i/B_z$$

where τ is the marginal tax cost to the representative consumer; π is the out-of-pocket cost of a dollar of taxes, $0 \leq \pi \leq 1$; m is the proportion of education expenditures met by matching aid, $0 \leq m \leq 1$; B_i is the equalized valuation per pupil in the i^{th} school district; and B_z is the state guaranteed valuation per pupil. Assigning representative values to the variables ($\pi = .7$, $m = .2$), without district power equalizing (B_i/B_z drops out of the formula) the marginal tax cost of an additional unit of education is 0.560. With district power equalizing and setting B_i equal to \$40,000 and B_z equal to \$50,000, $\pi = 0.448$. According to the first example in Section III, increased expenditures for education raised B_i to \$43,394. Consequently, in the second round, π rises to 0.486 and, education consumption decreases. The lowered education expenditure level is negatively capitalized and B_i declines from \$43,394, but is still greater than \$40,000. Therefore, although the increase in education spending is less than originally thought, it is still greater than without district power equalizing.

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